

## Re-Use Your CAD BUY NOW

The Model-Based CAD Handbook by J.B. Herron

### Weaving a Digital Thread for Manufacturing: STEP, QIF, and MTConnect

Posted on September 15, 2017 by Michelle Nordwald

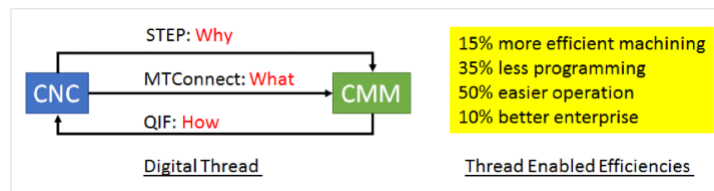
Dr. Martin Hardwick of Rensselaer Polytechnic Institute will present at the 2017 **Quality Information Framework (QIF) Symposium**. The 3D Collaboration & Interoperability Congress (3D CIC) and the QIF Symposium will be held in Golden, Colorado on October 3-5, 2017.

#### PRESENTATION

##### Weaving a Digital Thread for Manufacturing: STEP, QIF, and MTConnect

Sending models to manufacturing machines enables intelligent software to adapt solutions for current resources and configurations. Multiple attempts have been made to enable this by developing inter-operable standards starting with BCL in the 1970s. Originally, we were frustrated by low compute power. This prevented the simulation and verification necessary to adapt the models. Now, we are frustrated by the requirement to define inputs and outputs for both CNC and CMM machines. Recently, two DMDII projects have shown that this frustration can be eliminated using federated standards in a digital thread.

The Digital Thread was demonstrated by DMDII project 14-02-02 in October 2016, and by DMDII project 14-06-05 in July 2017. In the 14-06-05 project, three digital thread standards were used to communicate model data between design, planning, and manufacturing systems. The STEP standard was used to describe *why* measurements were necessary. The MTConnect standard was used to report *what* was being machined. The QIF standard was used to evaluate *how* well the tolerances were being met.



The three standards use different technologies to solve different problems:

1. STEP is an ISO standard for product model data because it is good at long-term archiving and maintaining upward compatibility for complex data translators.
2. MTConnect is an industry standard for process monitoring because it is good for real time communication.
3. QIF is an American national standard for quality planning and results reporting because it has a rich, flexible XML data format.

STEP is not good for quality reporting because its technology for long-term archiving is too complex for report generation. MTConnect is not good for quality reporting because its technology for real time communication is too brief for quality reporting. Therefore, the DMDII project selected QIF and used persistent Universally Unique Identifiers (UUID's) to relate requirements in STEP, to results in MTConnect, and reports in QIF. The result is a Federated Architecture for Digital Manufacturing that enables a model based supply chain with significant benefits for industry.

#### PRESENTER

##### Martin Hardwick

Professor of Computer Science  
Rensselaer Polytechnic Institute



As a specialist in data semantics for engineering applications, **Dr. Martin Hardwick** has supervised ten Ph.D. and numerous Masters students. Dr. Hardwick joined RPI in 1989 as an Assistant Professor and has risen through the ranks to be a tenured Full Professor with more than 60 referred papers. He has won several NSF grants, was a principle investigator for the DARPA Initiative in Concurrent Engineering project, the National Industrial Information Infrastructure Protocols (NIIP) project and the NIST ATP Model Driven Intelligent Control of Manufacturing project. He participated in the DARPA Advanced Vehicle Make (AVM) program and he is the leader for two DMDII projects. Currently he is the convener for the ISO working group on Digital Manufacturing (WG15) within the industrial data sub-committee (TC184/SC4). Software for STEP translation written by Dr. Hardwick is included in the libraries of many CAD and CAM systems. In 1991, he founded **STEP Tools, Inc.** with his graduate students. He received his bachelors and doctorate degrees from Bristol University in the UK.

#### 3D CIC + QIF SYMPOSIUM

The **3D Collaboration & Interoperability Congress** featuring the Quality Information Symposium focuses on 3D CAD collaboration and interoperability for the entire product lifecycle. With the 2017 theme of **UNITE: Engineering & Shop Floor Collaboration**, real users share their

experiences with turning design concepts into manufacturing product reality using 3D models. The joint 3D CIC and QIF Symposium event will be held **October 3-5, 2017** at the **American Mountaineering Center** in Golden, Colorado. Find out more and register for 3D CIC + QIF Symposium at [3dcic.com](http://3dcic.com).



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